REPLACED BY
ART 34 AMDT

Claims:

1. A method for optically testing semiconductor components (12) of a certain thickness (L) by using an optical interference system with at least one light source (1) for emitting a monochromatic light beam (2) having a wavelength (λ), for which the material of the semiconductor component (12) is at least partially transparent, wherein the light beam (2) is split into a reference beam (15) and a sample beam (16), the sample beam (16) is directed towards the semiconductor component (12) and, with the help of a detection system (41), the images produced by interference of the light beam (20) reflected by the semiconductor component (12) with the reflected reference beam (25) are recorded for a two-dimensional illustration of certain internal physical properties of the semiconductor component (12), characterized in that the sample beam (16) is directed at the backside (18) of the semiconductor component (12) to be tested and reflected at its topside (23), and that at least two interference images are detected in temporal sequence under different states of stress of the semiconductor component (12).

2. A method according to claim 1, characterized in that the coherence length (L_{Coh}) of the light beam (2) split into the sample beam (16) and the reference beam (15) is shorter than the optical path length $2{\cdot}L{\cdot}n$ of the semiconductor component (12) to be tested, where $\underline{L}$ is the thickness and $\underline{n}$ is the mean refractive index of the material of the semiconductor component (12).

3. A method according to claim 1 or 2, characterized in that the diameter of the sample beam (16) is adjusted to the area of the semiconductor component (12) to be investigated.

4. A method according to any one of claims 1 to 3, characterized in that the detected interference images are stored.

5. A method according to any one of claims 1 to 4, characterized in that the different states of stress are caused by the excitation of the semiconductor component (12) with at least one external stress, by which the certain properties of the semiconductor component (12) are influenced, and that at least one light beam (2) is emitted during the stress and a corresponding

interference image is detected.

6. A method according to claim 5, characterized in that the external stress is caused by high voltage or high power pulses.

7. A method according to claim 5, characterized in that the external stress is caused by flashes of light.

8. A method according to any one of claims 5 to 7, characterized in that several light beams (2) are emitted before, during and/or after the stress and the corresponding interference images are detected.

9. A method according to any one of claims 5 to 8, characterized in that the stress is detected and at least one light beam (2) is triggered at a pre-defined time (t_D) after the detection of the stress.

10. A method according to any one of claims 5 to 7, characterized in that a light beam (2) is emitted at least during the stressed state, and several interference images are detected before, during and/or after the stressed state.

11. A method according to any one of claims 5 to 10, characterized in that the backside (18) of the semiconductor component (12) is polished before optical testing.

12. A method according to any one of claims 1 to 11, characterized in that the interfering light beams are split, and the split partial beams are recorded by individual detection systems (41).

13. A method according to claim 12, characterized in that the detection system (41) is activated in dependence on the emitted light beams.

14. A method according to claim 12 or 13, characterized in that the emitted light beams (2) have different polarizations, preferably orthogonal polarization.

15. A method according to any one of claims 12 to 14, characterized in that the emitted light beams (2) have different wavelengths.

16. A method according to any one of claims 1 to 15,

characterized in that the reference beam (15) is reflected at a reference semiconductor component, wherein the reference semiconductor component is identical with the semiconductor component (12) to be tested.

17. A method according to any one of claims 1 to 16, characterized in that the intensity of the reference beam (15) is attenuated.

18. A method according to any one of claims 1 to 17, characterized in that the position of the reflected reference beam (25) is changed, e.g. by tilting the reference mirror, so as to optimize the interference image.

19. A method according to any one of claims 1 to 18, characterized in that the interference images are automatically compared to each other.

20. An arrangement for optically testing semiconductor components (12) of a certain thickness (L) with at least one light source (1) for emitting a monochromatic light beam (2) having a wavelength for which the material of the semiconductor component (12) is at least

partially transparent, and with a beam splitter (8) for splitting the light beam (2) into a reference beam (15) and a sample beam (16), and with at least one detection system (41) for recording the two-dimensional images produced by the interference of the light beam (20) reflected by the semiconductor component (12) with the reflected reference beam (25), characterized in that the backside (18) of the semiconductor component (12) faces the sample beam (16), that a stressing device (74) for emitting an external stress for the semiconductor component (12) is provided, and that furthermore a memory (81) for storing at least two interference images recorded at time intervals, and a device (133) for automatically comparing the interference images are provided.

21. An arrangement according to claim 20, characterized in that a device for adjusting the diameter of the emitted light beam (2), e.g. a beam expander (5), for enlarging the diameter is arranged in front of the light source (1).

22. An arrangement according to claim 20 or 21, characterized in that the stressing device (74) is con-

nected with a device (76) for controlling the light source (1).

23. An arrangement according to claim 22, characterized in that the control device (76) comprises a delaying device.

24. An arrangement according to any one of claims 20 to 23, characterized in that the detection system (41) comprises a beam splitter (126) for separating the light beams into individual light beams with different light parameters and one camera (22) each for recording images of these individual light beams.

25. An arrangement according to claim 24, characterized in that the beam splitter (126) comprises a polarizing device (166) for separating the light beams into individual light beams with different polarization.

26. An arrangement according to claim 24 or 25, characterized in that the beam splitter (126) comprises dichroic beam splitters (189) for splitting the light beams into individual light beams with different wavelengths (λ).

27. An arrangement according to any one of claims 20 to 26, characterized in that a collimator (10) is arranged upstream of the semiconductor component (12) for parallel adjustment of the sample beam (16).

28. An arrangement according to any one of claims 20 to 27, characterized in that an attenuator (26) is arranged in the path of the reference beam (15).

29. An arrangement according to any one of claims 20 to 28, characterized in that a device for changing the position of the reflected reference beam (25) is provided which is formed by a device for tilting the reference mirror (24).

30. An arrangement according to any one of claims 20 to 29, characterized in that the device (133) for automatically comparing the interference images recorded in temporal sequence is formed by a computer (80).

31. An arrangement according to any one of claims 20 to 30, characterized in that the light source (1) is formed by a laser.

32. An arrangement according to any one of claims 20 to 31, characterized in that the detection device (41) includes a camera (22), e.g. a vidicon or CCD camera.

33. An arrangement according to any one of claims 20 to 32, characterized in that the detection device (41) includes a two-dimensional multi-element detector.